NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM
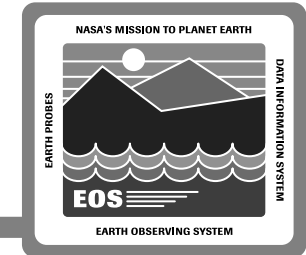
EOS

EARTH OBSERVING SYSTEM

System I&T Wrap-up
## Gil Scott

28 February 1995

Verification Goals

Field a Working ECS That:

- **Satisfies Baselined Requirements**
  - **Verify IRDs and Level 3 Requirements**
  - **Traceability Assures that all Requirements are Verified - RTM Tool**
- **Is Ready for ESDIS Integration**
  - **External Interfaces are Tested/Verified**

    Early Engineering-level Testing with Outside Systems

    Formal Test with Simulators or Actual Interfaces
  - **System Installed at Sites - Site-Site Interfaces Verified**

    Hardware Acceptance is Performed
- **Fulfills User Needs**
  - **Verification Above Unit Level is Driven by User Scenarios**
  - **Segment I&T Focuses on Small Portions of a Scenario - A Thread**
  - **System I&T Focuses on Longer Threads**
  - **Acceptance Testing Uses Actual User/OPS Scenarios**
- **Provides Representative Sample of Real Data to Support Testing**

Verification Program Summary
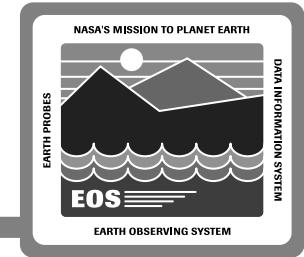
The ECS Verification Program is a Progressive Group of Activities That:

- **Are Performed by Developers, Segment I&T, System I&T and the IATO**
- **Examine Larger and Larger Parts of the System**
- **Are Requirements Driven, But Approach from Different Points-of-View**
- **Are Appropriate to the Criticality of the Function Under Test**
- **Are Witnessed by Different Groups**
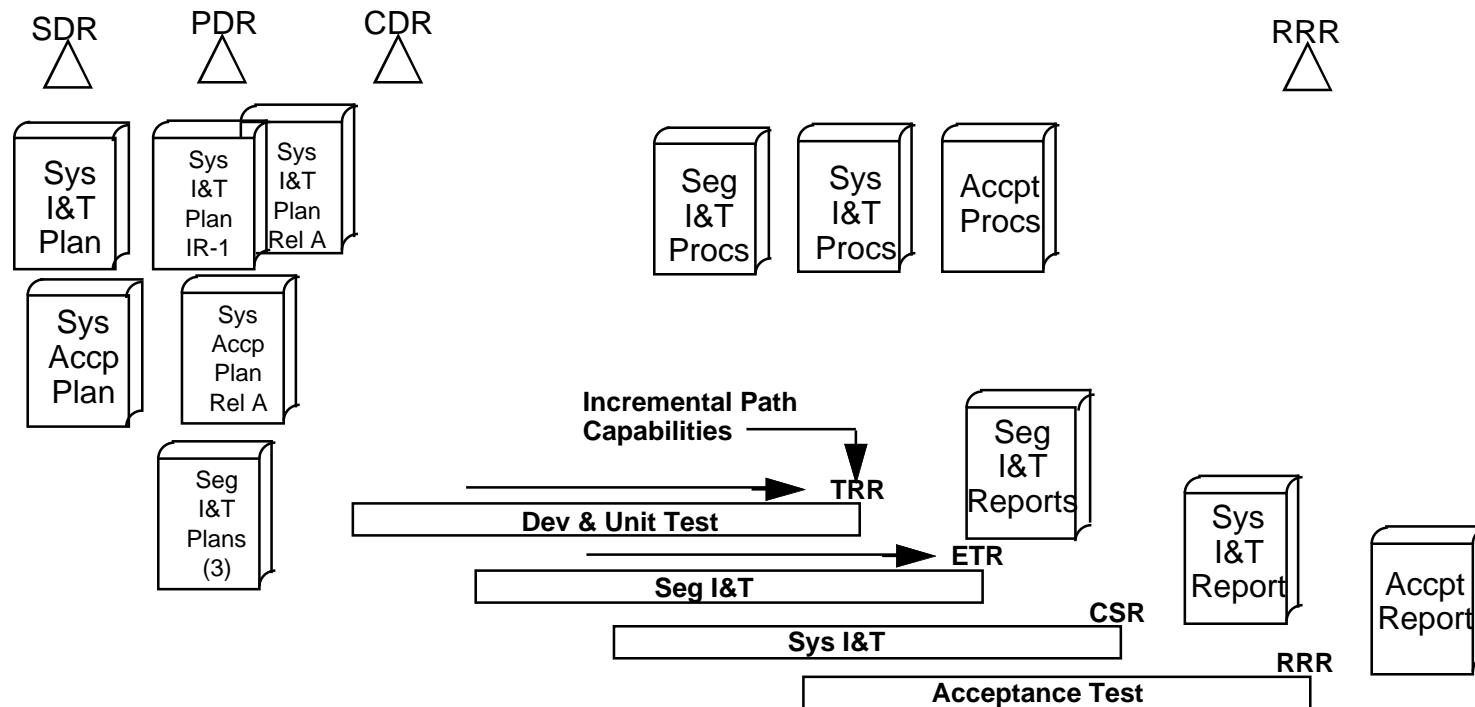- **Are Described in a Progression of Documents**

User Involvement

It is Recognized that:

- **The Ultimate System Must Support Users & Operations Personnel**
- **Requirements in Isolation Often Don't Capture those Needs**
- **Without Understanding Those Needs, Verification Is Incomplete**

- **Participation**
  - **User Review of Plans & Procedures**
  - **Incorporate ECS Tirekickers and M&O Personnel as Operators in Tests**
  - **Intend to Schedule Beat-and-Bash Sessions During Preparation**

Status - Roadmap

SDR
PDR
CDR
RRR

Sys I&T Plan

Sys I&T Plan IR-1

Sys I&T Plan Rel A

Seg I&T Procs

Sys I&T Procs

Accpt Procs

Sys Accp Plan

Sys Accp Plan Rel A

Seg I&T Plans (3)

Incremental Path Capabilities

Seg I&T Reports

Dev & Unit Test → TRR

Seg I&T → ETR

Sys I&T Report

Sys I&T → CSR

Accpt Report

Acceptance Test → RRR
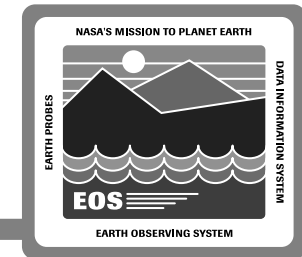
Legend:
TRR   Test Readiness Review
ETR   Element Test Review
CSR   Consent to Ship Review
RRR   Release Readiness Review

Progress Since SDR
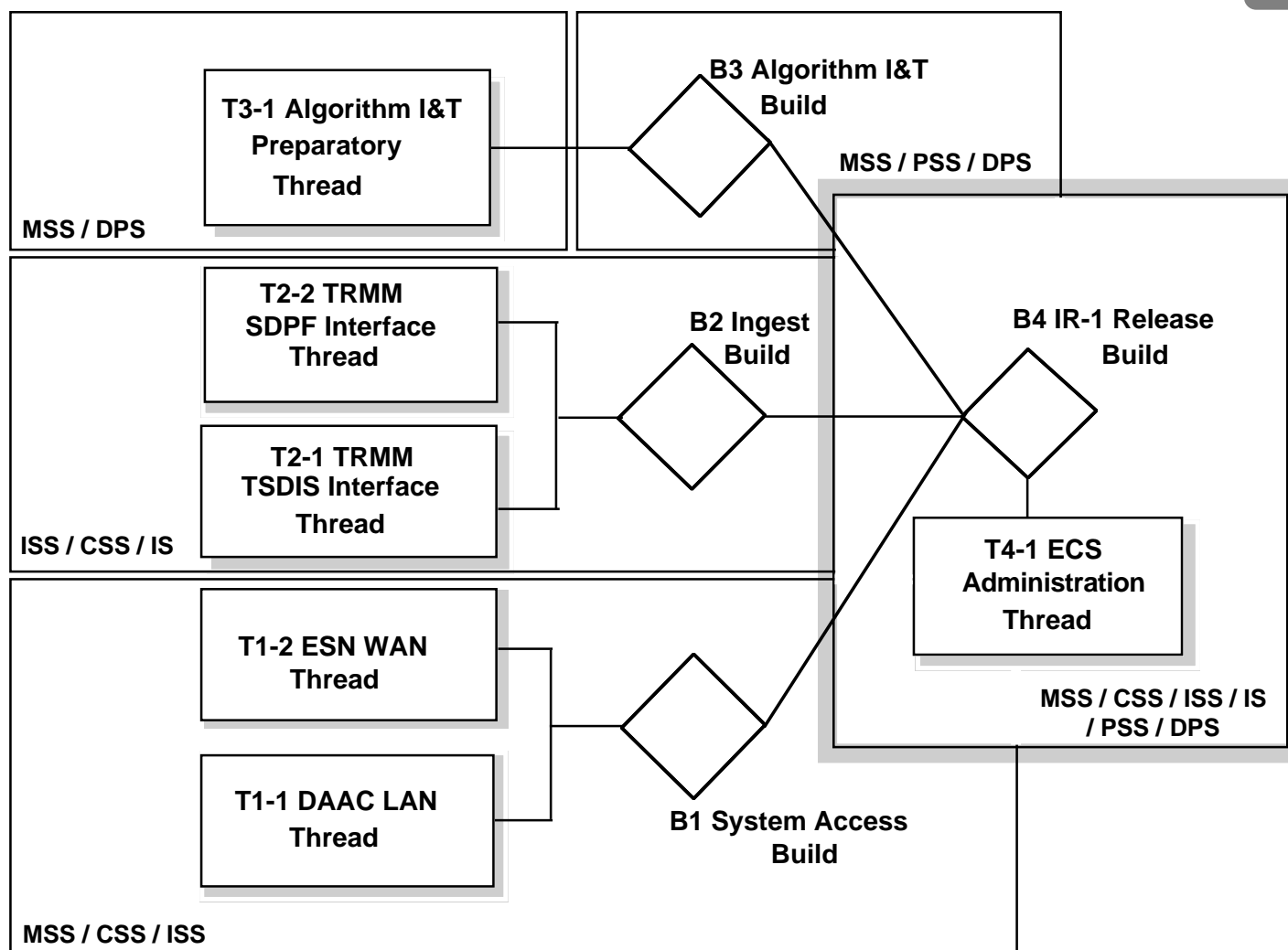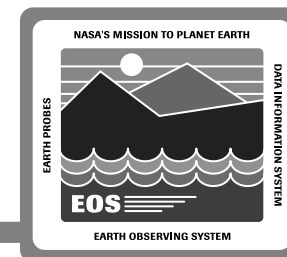
System I&T Plan - IR-1   194 Pages

System I&T Plan - Rel A   506 Pages

System Acceptance Plan   260 Pages

Verification Specification -

- **Maps Level 3 Requirements to Releases**

- **Requirement Criticality**

- **Maps Level 3 Requirements to Tests in Plans (above)**

All Documents Available on the EDHS

IR-1 Build/Thread System Integration

MSS / DPS

T3-1 Algorithm I&T Preparatory Thread

B3 Algorithm I&T Build

MSS / PSS / DPS

ISS / CSS / IS

T2-2 TRMM SDPF Interface Thread

T2-1 TRMM TSDIS Interface Thread

B2 Ingest Build

B4 IR-1 Release Build

T4-1 ECS Administration Thread

MSS / CSS / ISS / IS / PSS / DPS

MSS / CSS / ISS

T1-2 ESN WAN Thread

T1-1 DAAC LAN Thread

B1 System Access Build

TRMM Release System I&T

- **Performed at EDF**
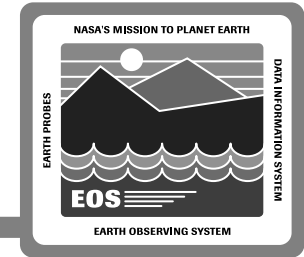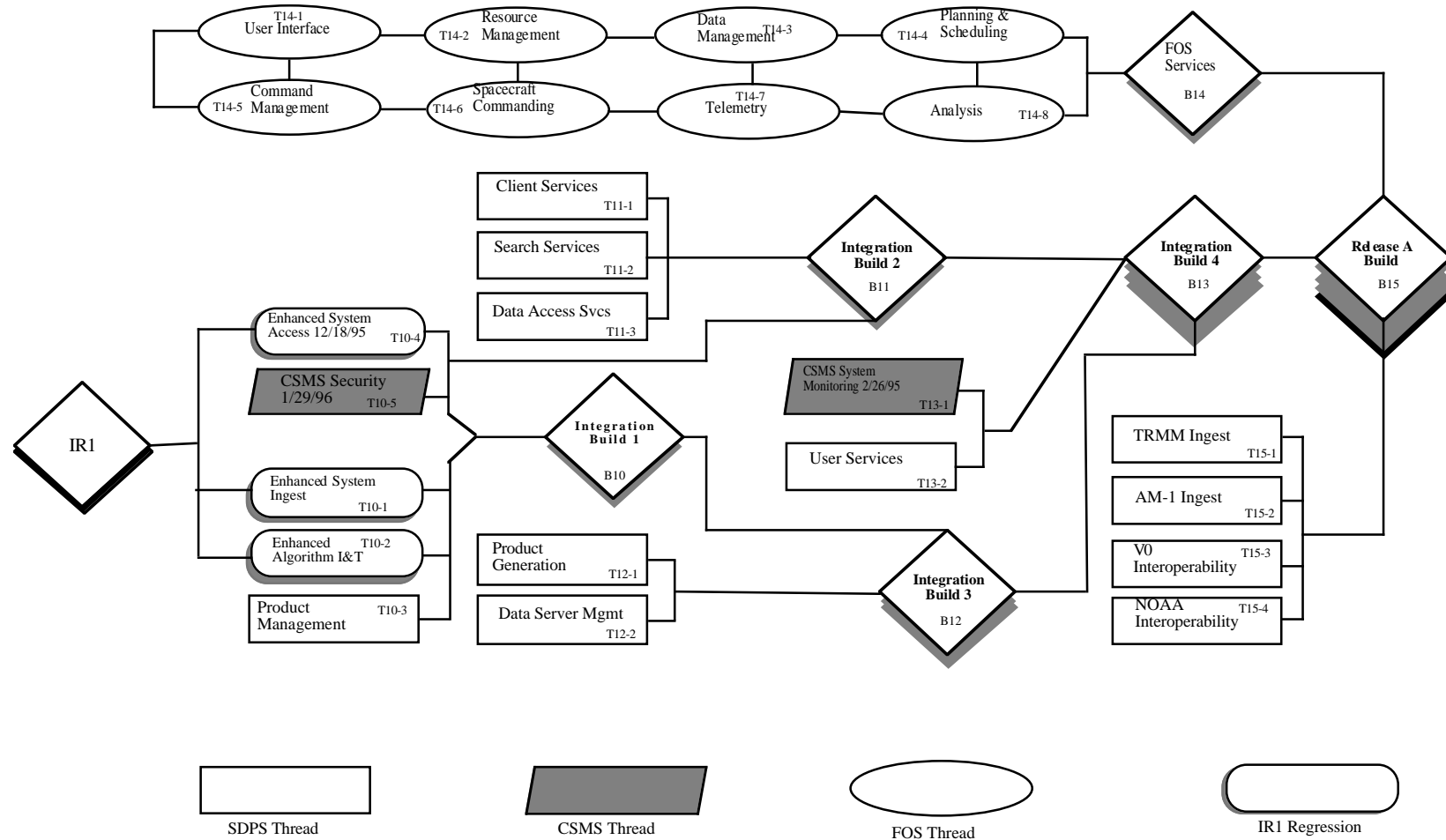- **Total of 24 Threads and 6 Builds in SI&T Plan**
- **Turnovers from Development**
  - **CSMS: 2**
  - **SDPS: 5**
  - **FOS: 3**

TRMM Test Objectives

- **To Verify End-to-End System Operations to Include:**
  - **Data Ingest and Validation**
  - **Data Production**
  - **Data Storage**
  - **Client/User System Access**
  - **System Operability**
  - **Interoperability - V0 and NOAA**
- **Early AM-1 Interface Testing to Include:**
  - **Data Ingest and Validation**
  - **Spacecraft Command, Control, and Monitoring (EOC)**
- **Early Landsat 7 Interface Testing to Include:**
  - **Ingesting of L7 Product Data**

TRMM System Build/Thread Plan

NASA'S MISSION TO PLANET EARTH

EARTH PROBES

DATA INFORMATION SYSTEM

EOS

EARTH OBSERVING SYSTEM

Top Row (FOS Threads)

- T14-1 User Interface
- T14-2 Resource Management
- T14-3 Data Management
- T14-4 Planning & Scheduling
- T14-5 Command Management
- T14-6 Spacecraft Commanding
- T14-7 Telemetry
- T14-8 Analysis
- B14 FOS Services

Integration Builds

- T11-1 Client Services
- T11-2 Search Services
- T11-3 Data Access Svcs
- B11 Integration Build 2
- B13 Integration Build 4
- B15 Release A Build

- T10-4 Enhanced System Access 12/18/95
- T10-5 CSMS Security 1/29/96
- T10-1 Enhanced System Ingest
- T10-2 Enhanced Algorithm I&T
- T10-3 Product Management
- B10 Integration Build 1

- T13-1 CSMS System Monitoring 2/26/95
- T13-2 User Services

- IR1

- T12-1 Product Generation
- T12-2 Data Server Mgmt
- B12 Integration Build 3

- T15-1 TRMM Ingest
- T15-2 AM-1 Ingest
- T15-3 V0 Interoperability
- T15-4 NOAA Interoperability

Legend

- SDPS Thread (rectangle)
- CSMS Thread (parallelogram)
- FOS Thread (ellipse)
- IR1 Regression (rounded rectangle)
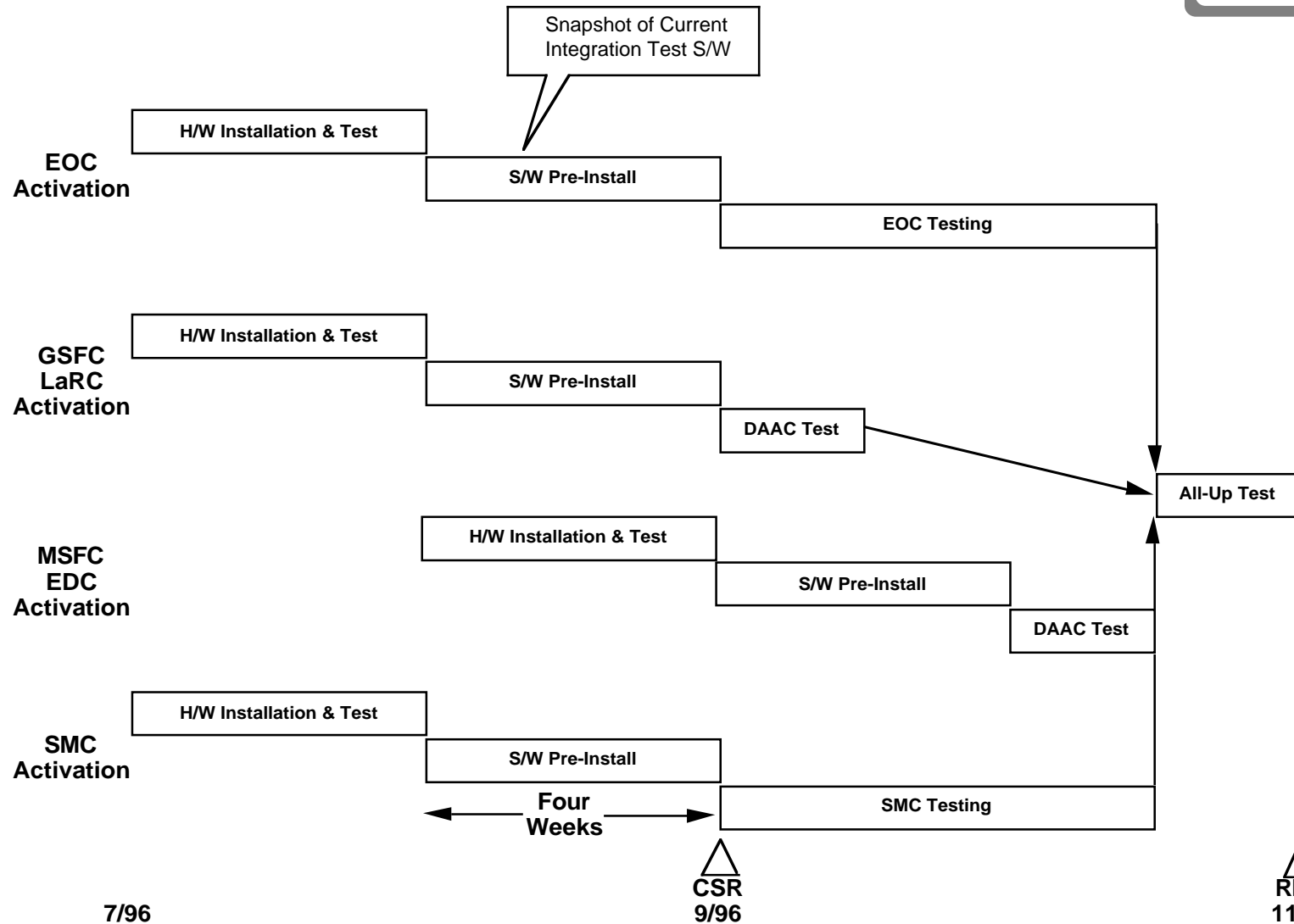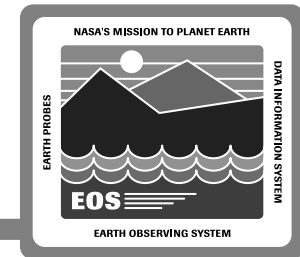
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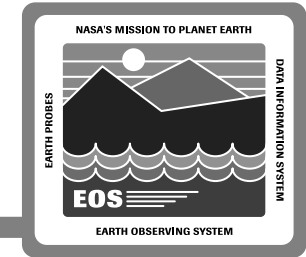
GS-10

Acceptance Testing

The Overall System Acceptance Test for the TRMM Release is the final development contractor test activity. The activity verifies the function and performance of the ECS release against the Level 3 requirements.

- Lead by the Independent Acceptance Test Organization (NYMA)
- Performed at the TRMM Release DAACs (GSFC, MSFC, LaRC, EDC), the SMC and the EOC
- CSR and SORR are the entry events
- RRR is the completion event
- Details of the Acceptance Process Documented in The Acceptance Test Management Plan (ATMP) DID 415 submitted at SDR (available on the EDHS)

Installation Process

Snapshot of Current Integration Test S/W

EOC Activation
- H/W Installation & Test
- S/W Pre-Install
- EOC Testing

GSFC LaRC Activation
- H/W Installation & Test
- S/W Pre-Install
- DAAC Test

All-Up Test

MSFC EDC Activation
- H/W Installation & Test
- S/W Pre-Install
- DAAC Test

SMC Activation
- H/W Installation & Test
- S/W Pre-Install
- SMC Testing

← **Four Weeks** →

7/96

△ **CSR** 9/96

△ **RRR** 11/96
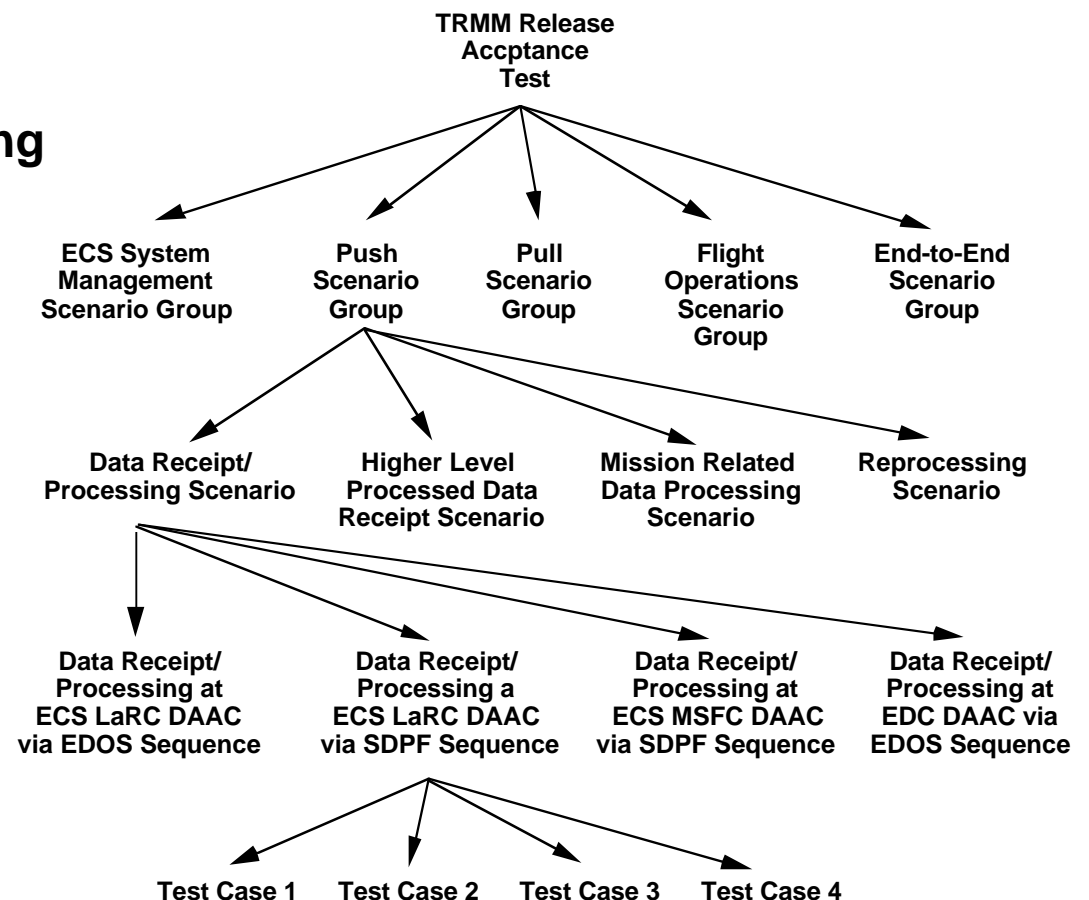
TRMM Release System Acceptance Test

Acceptance Testing is Scenario Oriented

Scenario Definition Driven By:

- **OPS Concepts**
- **User Characterization Modeling**
- **Segment Scenarios**
- **Requirements Verification**

Test Plan Structure

TRMM Release
Accptance
Test

- ECS System Management Scenario Group
- Push Scenario Group
- Pull Scenario Group
- Flight Operations Scenario Group
- End-to-End Scenario Group

Push Scenario Group:
- Data Receipt/ Processing Scenario
- Higher Level Processed Data Receipt Scenario
- Mission Related Data Processing Scenario
- Reprocessing Scenario

Data Receipt/ Processing Scenario:
- Data Receipt/ Processing at ECS LaRC DAAC via EDOS Sequence
- Data Receipt/ Processing a ECS LaRC DAAC via SDPF Sequence
- Data Receipt/ Processing at ECS MSFC DAAC via SDPF Sequence
- Data Receipt/ Processing at EDC DAAC via EDOS Sequence

Data Receipt/ Processing a ECS LaRC DAAC via SDPF Sequence:
- Test Case 1
- Test Case 2
- Test Case 3
- Test Case 4

Scenario Groups

ECS System Management Group -

- **ECS Element M&O Support Scenario**
- **ECS Element Upgrade Scenario**
- **Scheduling Scenario**
- **Configuration Management Scenario**
- **Performance Management Scenario**
- **Ancillary Services Scenario**

Push Group -

- **Data Receipt/Processing Scenario**
- **Higher Level Processed Data Receipt Scenario**
- **Reprocessing Scenario**
- **Mission Related Data Processing Scenario**
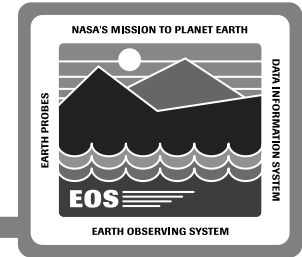
Scenario Groups (cont.)
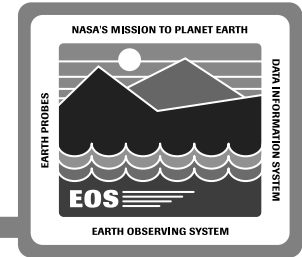
Pull Group -

- **Science User Scenario**
- **SCF Science User Scenario**

Flight Operations Group -

- **FOS Initialization Scenario**
- **Pre-Contact Planning Scenario**
- **MISR IST Planning Scenario**
- **Real-Time Contact Scenario**
- **Planning Scenario**
- **IST Telemetry Access Scenario**
- **Telemetry Analysis Scenario**
- **MISR IST Planning Scenario #2**

Scenario Groups (cont.)

End-to-End Group -

- **Multi-Site Intercommunications and Interoperations Scenario**
- **TRMM Mission Support Scenario**
- **Landsat-7 Mission Support Scenario**
- **AM-1 Mission Support Scenario**
- **Earth Science Data System Access and Interoperability Scenario**
- **System Performance Scenario**